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MISCELLANEOUS STUDIES IN THE HENICOCEPHALIDÆ

(Hemiptera)

BY R. L. USINGER
Oakland, California

The family Henicocephalidæ is one of the smaller families of the Hemiptera comprising some seventy-two species, both fossil and living. It has been placed in the first phalanx of the great predaceous superfamily Reduvioideæ. The group seems to be very primitive and is cosmopolitan in its distribution, being found on all of the main continents and on the major island groups with the exception of the Hawaiian Islands. The principle work on the group has been done by Dr. Bergroth, who published many papers describing nearly one-third of the living species. As early as 1893 Dr. Bergroth announced his intention of monographing the family and it is indeed regrettable that he was unable to do so. However, because of his familiarity with the group, the author has followed him in matters dealing with the validity of the genera as he had the material before him and was much more competent to judge than others who used different arrangements of the genera. Other major contributions have been made by Distant, Kirkaldy and Breddin. Bruner (1924) gave a list of the species but listed only thirty-two of the sixty-four living species known at that time.

The author is indebted to Mr. E. P. Van Duzee of the California Academy of Sciences for the loan of much material from the Academy collection, including the new species here described, as well as for his valuable aid in the preparation of this paper; to Dr. E. C. Van Dyke of the University of California for his generous assistance in many of the problems encountered; to Dr. H. M. Harris of the Iowa State Agricultural College for his comparison of one of the author's species with the Drake and Harris types, and to Mrs. Frieda Abernathy for the excellent plate.

Morphology

Specific differences in this family have been based mainly upon the shape of the head, pronotum and legs and to some extent upon color. To what extent these characters may be used is difficult to determine because of the difficulty of distinguishing the sexes of some species. Bergroth (1905) gives us a note concerning the distinguishing of the sexes which is very helpful. The author has not attempted sexual differentiation in *Systelloderus* as the genital segment in this genus apparently gives very little indication of the sex. The three appendages referred to by Bergroth were not observed in *Systelloderus* although they were readily discernible in *Henicocephalus*. Numerous and fresh examples which may be dissected are necessary to clear up this point. According to Bergroth's note the species described by Kirkaldy (1908) as *Henicocephalus corticicola* will probably prove to be the female of *H. fungicola* Kirk. described on the same page and from the same locality.

The rostrum is very primitive in the entire group. The labrum and maxillary palpi, of which it is composed, well indicated, very distinct in the primitive genera *Aenictopechys* and *Aerorchestes* and fused toward the base in *Gamostolus*. In *Systelloderus* the labrum is well indicated and tumid on the basal segment and the maxillary palpi are separated by a distinct longitudinal line apically. The rostrum is very broad at the base and comparatively robust throughout. In *Henicocephalus* [*formicina* (Uhl.)] the rostrum is more slender and fragile, fused toward the base and halved by a less distinct longitudinal line.

The wing venation has been described and figured by Kirby (1891), Kirkaldy (1901 and 1908), Breddin (1905), and Johannsen (1909). The author has referred to the above works in an effort to apply the Comstock system of uniform terminology to the veins and has figured the venation of the two North American genera to aid in their separation. As the tracheation of the wings has not been investigated the author may have fallen into error in the naming of some of the veins, but it is hoped that the attempt may encourage further work along this line. Sc in figure 1 appears to be merely the subcostal fold, but is considered here to be an indication of the subcostal vein

as it is found in another species, *H. maclachlani* Kirk. If this is not true, R of figures 1 and 2 probably represents a coalescence of the subcosta and radius. M + Cu, figure 1, actually appears double and is undoubtedly a coalescence of the media and cubitus. The small cross vein between A_{1+2} and the inner margin is not named but is present in most of the species figured and in all of the species which the author has examined.

The fore legs have long been used in the classification of this group and Bergroth (1915) speaking of some Asiatic *Henicocephalus* says of the hind legs: "The shape of the hind femora has not hitherto attracted the attention it deserves; it is in fact of importance as a specific character in this as well as in other groups of the genus."

Biology

Our rather scanty knowledge of the habits of the Henicocephalidæ has been accumulated through scattered references to collectors' notes very often at the time of description of the various species. Perhaps the most striking characteristic, as has been noted by Blanchard (1852) for *S. moschatus* Blanch., Berg (1879 and 1893) for *H. spurculus* Stål, Mr. Green (Kirby 1891) for *H. telescopicus* (Kirby), and by many observers in the United States and Mexico for *Hymenodectes culicus* Uhler = *S. biceps* (Say), is their habit of forming in large swarms and dancing up and down in the sunlight in what appears to be a nuptial flight, as they have often been taken in copulation. Authors observing this have likened them variously to Mosquitoes, Chironomidæ, Nemocera, and Ephemeridæ. Other records of the flight of these insects are by Schouteden (1905), who describes *H. cornifrons* from Belgian Congo; Blatchley (1926), who took *S. biceps* (Say) at Royal Palm Park, Florida; and the author, who has *S. biceps* (Say) taken by A. R. Park, Jr., at Urbana, Illinois, and *H. formicina* (Uhl.) from Berkeley, California, all taken at light.

However, they have more often been found on the ground under stones and débris or running among dead leaves in the forest where they may prey upon other insects to the best advantage. The following authors have observed this: Mr. Gravely (Distant, 1911) for *H. limbatipennis* Dist. in Ceylon, H. M. Harris (Drake and Harris, 1927) for *S. terrenus*

D. and H. in Iowa, and many authors in the United States for *S. biceps* (Say). Under the bark of dead trees Kirkaldy (1908) took *H. fungicola* Kirk. and *H. corticicola* in Fiji, Barber (in remarks after Knab, 1908) took *S. biceps* (Say) in Tennessee and Maryland, and C. J. Drake (Drake and Harris, 1927) took *S. inusitatus* D. and H. at Woodville, Mississippi.

Of the actual predaceous habits of these insects we have some exceedingly interesting records: Mally (1903) noted the paralyzing effect of the bite of a South African species which later was described (Distant, 1904) as *H. pugnatorius* Dist., F. A. Fenton (Drake and Harris, 1927) took *S. iowensis* D. and H. in a "concentration cage" where the species was feeding on the emerging adults of the Hessian Fly, *Mayetiola destructor* Say, at Onawa, Iowa. Perhaps the most interesting along this line, however, are the records of Bergroth to myrmecophagous species. Bergroth (1903) describes *H. braunsii* Bergr., taken by Dr. Brauns in the nest of *Rhoptromyrmex transversinodis* Mayr in Cape Colony. As the ant is much smaller than its guest and as the Henicocephali are predaceous, Bergroth expresses the opinion that the species is myrmecophagous. Bergroth (1915a) describes still another species, *H. myrmecophilus* Bergr., taken again by Dr. Brauns, also from the Cape of Good Hope. This species was taken in the nest of *Camponotus cognatus* Sm., an ant which is considerably larger than its guest, consequently Bergroth expresses the belief that this *Henicocephalus* preys upon the eggs and larvæ of the ant.

Finally an interesting observation is of the musky odor emitted by some of the species of this group. Those who have noted this are Blanchard (1852) for *S. moschatus* Blanch. (which was named for the above characteristic) in Chile, and Berg (1893) for *H. spurculus* Stål taken in the Garden of the Art Gallery, Buenos Ayres. Bergroth (1915a) ventures the opinion that *H. myrmecophilus* Bergr. is protected from the attacks of the ants by this odor.

Taxonomy

Phalanx Henicocephaliformes Reuter (1910)

Rostrum four-segmented. Prosternum without a stridulatory sulcus. Wings totally membranous, provided with longitudinal veins and a few transverse veinules.

The above has been modified from Reuter (1910), who described the rostrum as three-segmented. This phalanx may be separated from the phalanx Reduviiformes Reut. by the absence of the prosternal stridulatory sulcus and from the Nabiformes Reut. by the totally membranous wings.

Family Henicocephalidæ Stål (1860)

Head constricted behind the eyes, except in *Aenictopechys* Breddin, the posterior lobe subglobose to transverse. Labrum and maxillary palpi more or less distinct. Antennæ four-segmented. Ocelli distinct, located anteriorly on the posterior lobe of the head, in bilobed genera. Metasternal orifices wanting. Anterior legs thickened, the tibiæ dilated apically.

The above has been very much modified from Reuter (1910) who apparently was unaware of Breddin's work. The family Enicocephalidæ was founded by Stål (1860) for Westwood's genus *Enicocephalus*. Later Stål (1865) emended this to its proper form Henicocephalida = Henicocephalidæ and it has been used almost universally in this form since that time. However, Van Duzee (1917), following his policy of using the original form of a name and leaving it to the individual to accept or reject the emendation as he wishes, revived the original form. Several recent authors have followed this, but this author accepts the emended form as it seems both permissible and desirable to do so.

Key to Subfamilies

Pronotum roundly narrowing from base to apex, not divided by two deep transverse impressions into three lobes..... ..... *Aenictopechinæ* subfam. nov.

Pronotum divided by two deep transverse impressions into three lobes..... *Henicocephalinæ* Ashmead

Subfamily **Aenictopechinæ** subfam. nov.

Pronotum roundly narrowing from base to apex, not divided by transverse constrictions into three lobes.

Type *Aenictopechys* Breddin (1905)

This subfamily is proposed for the reception of *Aenictopechys* Breddin (1905) and *Gamostolus* Bergroth (1927). Neither of these genera agree with the family Henicocephalidæ as formerly understood, so the scope of the family has been enlarged and the genera are segregated into two subfamilies, according to whether the pronotum is trilobed or entire.

KEY TO THE GENERA OF AENICTOPECHINÆ subfam. nov.

Head scarcely longer than wide, without a transverse impression behind the eyes. Venation very simple, the veins not reaching apex of wing ..... *Aenictopechys* Breddin

Basal lobe of head well defined anteriorly by a transverse impression. Venation as in *Henicocephalus* Westwood..... ..... *Gamostolus* Bergroth

Subfamily HENICOCEPHALINÆ Ashmead (1893)

Pronotum divided by two transverse impressions into three lobes.

Type *Henicocephalus* Westwood (1837)

This subfamily is the family Henicocephalidæ as treated by most authors, and most references to the family Henicocephalidæ should be referred to this subfamily which was originally proposed under the Reduviidæ.

KEY TO THE GENERA OF HENICOCEPHALINÆ Ashmead

1. Discal cell closed, fig. 1 (except in *H. maclachlani* Kirk. and *H. myrmecophilus* Bergr.) As a rule larger and darker species, strongly pilose..... 2

—. Discal cell open, fig. 2..... 3

2. Eyes normal, fairly large but not contiguous above or below .....*Henicocephalus* Westwood

—. Eyes greatly enlarged. Contiguous both above and below throughout all their length. Occupying almost the whole head.....*Cocles* Bergroth

3. Pronotum divided into six lobes. Fore-coxal cavities closed behind. Intermediate and hind tarsi one-segmented..... ..... *Aerorchestes* Bergroth

—. Pronotum divided into three lobes, sometimes appearing four-lobed if the longitudinal impression is deep on the intermediate lobe. Fore-coxal cavities open behind. Intermediate and hind tarsi two-segmented.....*Systelloderus* Blanchard

Our two North American genera are next briefly characterized and two new species are described in *Systelloderus*.

Genus SYSTELLODERUS Blanchard (1852)

Very small glabrous species. Discal cell open (fig. 2). Pronotum rather robust, not so abruptly narrowing apically as in some *Henicocephalus*. Fore-coxal cavities open behind. Anterior tarsi one-segmented, intermediate and hind tarsi two-segmented. Tarsi with two long claws. Posterior lobe of head subglobose.

Genotype *Systelloderus moschatus* Blanchard

The genus *Systelloderus* comprises a natural group of closely

allied species which may conveniently be separated from the extremely variable *Henicocephalus*. Dr. Bergroth (1915a) says, "Under the described *Henicocephalus* there are, indeed, some very small and glabrous species, in which the discoidal cell is lacking, but these belong to the genus *Systelloderes* Blanch. (= *Henschiella* Horv. and *Hymenodectes* Uhl.), which is very different from the genus *Henicocephalus*, as I shall set forth in a later work."

The genus *Systelloderes* was first emended to its correct Latin form by Walker (1873), who considered it a synonym of *Henicocephalus*. He was followed by Bergroth (1889) and also by Karsch (1892), who considered it a subgenus of *Henicocephalus*. Lethierry and Severin (1896), considering the genus a synonym of *Henicocephalus*, also used the correct form but were "corrected" by Kirkaldy (1901). The original form was then used by Bergroth and others until Van Duzee (1917) used the Latin form. In this he was corrected by Parshley [1]. Drake and Harris (1927) used the Latin form, and it is used in this work as it is a permissible emendation according to the Entomological Code.

Systelloderus crassatus Usinger, n. sp., Fig. 6

Near *S. angustatus* (Champion 1898) but lighter, fusco-testaceous, the rostrum, legs, antennæ, and anterior and intermediate lobes of pronotum testaceous. Front femora more incrassate than in either *angustatus* (Champ.) or *iowensis* D. and H., thicker than width of posterior lobe of head.

Rather thickly pilose, shining; head longer than pronotum; posterior lobe subglobose, more nearly parallel-sided than in other species, measured from anterior to posterior constriction slightly longer than broad, 6:5.5; length and width equal in *angustatus*, length distinctly less than width in *biceps* (fig. 5); width of posterior lobe equal to, or slightly less than, width of anterior part including eyes. Antennæ about as long as head and half the pronotum; first segment stouter and shorter than the rest, second somewhat thickened and infuscated apically; proportional length of segments I:II:III:IV::6.5:14:14:12. Pronotum as long as broad; feebly emarginate in front, shallowly and roundly emarginate on the posterior border; a distinct median sulcus deep on the intermediate lobe and indicated on all three lobes; intermediate lobe (measured along lateral

1 Science, N. S., XLVII, No. 1212, p. 293, 1918.

margin) longer than posterior lobe, 6::5; anterior lobe distinctly broader than basal lobe of head, a little more than half the width of intermediate lobe which is slightly narrower than the posterior. Scutellum carinate apically; length and width subequal. Wings exceeding the tip of the abdomen; discal cell open. Anterior femora greatly incrassate, thicker than width of posterior lobe of head, 6::5.5; a little more than twice as long as broad. Anterior tibiæ shorter than femora, widened and flattened apically with seven sharp spines at the inner apical angle, a little more than twice as long as broad. Tarsi with two long claws. Posterior femora also greatly incrassate; almost as thick, although not so robust, as anterior femora; a little over twice as long as broad.

Color testaceous; faintly infuscated on the anterior lobe of the head and on the thickened portion of second antennal segment, more pronounced on the roughened posterior lobe of the pronotum; intermediate and hind legs and venter stramineous.

Length, 3.25 to 3.58 mm.; width, .16 mm.

Type No. 3621, Mus. Calif. Acad. Sci., collected by J. O. Martin at Palm Springs, California, on March 26, 1917. Paratype, same data as the type, in the Academy collection.

Dr. Halbert M. Harris has very kindly compared *crassatus* with *iowensis* D. and H., which is likewise very near *angustatus* (Champ.), and gives the following notes. "*Systelloderus crassatus* Usinger (*ms*) differs from species described by Drake and Harris in having a longer, more parallel-sided posterior lobe of head, longer pronotum, and more strongly incrassate fore femora. In *iowensis* the depth of the front femora as compared to width of posterior lobe of head is in ratio, femora: head :: 11:13; in *crassatus* the ratio is 14:13."

Systelloderus nitidus Usinger, n. sp., Fig. 4

Smooth, shining; testaceous to fuscous; sparsely clothed with short hairs. Head longer than pronotum; posterior lobe broader than long, 4::5, and subequal in width to anterior lobe including eyes, subquadrate, constricted behind to form a short neck. Antennæ about as long as head with the anterior and intermediate lobes of pronotum; first segment shortest, stout, second slightly clavate, third filiform, fourth fusiform; proportional length of segments I:II:III: IV::5:10:9:9. Rostrum stout, very little shorter than head. Pronotum slightly broader than long, 19::16, narrowed anteriorly; length equal to width of intermediate lobe; anterior and intermediate lobes smooth, shining; anterior lobe slightly wider than posterior lobe of head, its anterior margin deeply emarginate, its length (median measurement) subequal to that of posterior lobe, one-third that of intermediate lobe; intermediate lobe (measured along lateral

margin) slightly longer than posterior lobe, divided into two subovaL lobes by a median longitudinal impression that is distinct anteriorly, obscure or wanting posteriorly, its posterior margin overlapping anterior margin of posterior lobe; posterior lobe with a sulcus very deeply impressed behind the postero-lateral angles of the intermediate lobe, less deeply impressed and concavely sinuate at the middle; posterior lobe lightly roughened, its posterior margin shallowly but distinctly emarginate. Scutellum broader than long, abruptly and distinctly carinate on its apical one-third. Wings exceeding the tip of the abdomen; discal cell open (fig. 2). Anterior legs stout, laterally compressed; femora not so thick as width of posterior lobe of head, 4::5, a little more than two and one-half times as long as broad; tibiæ strongly dilated apically, a little more than twice as long as broad, the inner apical angles bearing several sharp spines; tarsi with two sharp recurved claws. Intermediate and hind legs slender except for the posterior femora which are moderately incrassate.

Color flavous, the sides of, or often the entire posterior lobe of head faintly infuscated. Anterior lobe of head fuscous, becoming lighter anteriorly; rostrum testaceous to pale fuscous; eyes fuscorufous, ocelli red. Antennæ varying from uniformly pale testaceous to a fuscous first segment, flavous second segment, and stramineous to white third and fourth segments in fully pigmented specimens. Scutellum often with a median basal spot, ivory-white. Venter white.

Length, 2.25 to 2.5 mm.

Type No. 3622, Mus. Calif. Acad. Sci., collected by R. H. Painter at Puerto Castilla, Honduras, April 20, 1926. Seventeen paratypes, same data as type, in collection of California Academy of Sciences, U. S. National Museum, C. J. Drake, and the author.

Genus Henicocephalus Westwood (1837)

As a rule, larger species than in ***Systelloderus*** Blanch., darker and rather thickly pilose. Posterior lobe of head transverse to globose. Pronotum divided into three lobes. Discal cell closed (fig. 1). Forecoxal cavities open behind. Anterior tarsi one-segmented, intermediate and hind tarsi two-segmented. Tarsi bearing one or two claws.

Genotype *Henicocephalus flavicollis* Westwood

An extremely variable group of species two of which (*H. maclachlani* Kirk. and *H. myrmecophilus* Bergr.) have the discal cell open as in *Systelloderus*. Others (*H. basalis* Westw., *H. robustus* Dist., *H. dubius* Jeannel, and perhaps others) have the robust pronotum found in *Systelloderus*. The number of claws varies, depending upon the species, *H. pilosus* Champ.,

H. emarginatus Champ., and *H. flavicollis* Westw. having only one claw.

Our single North American species is figured (fig. 3).

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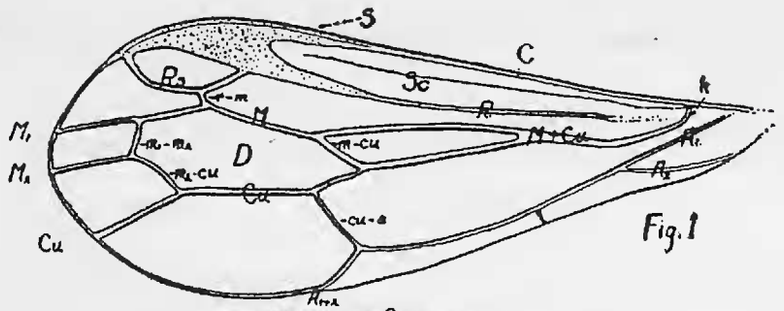

Fig. 1

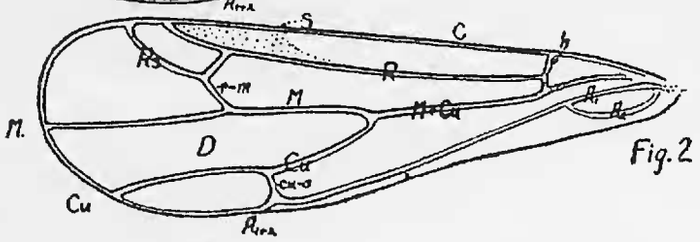

Fig. 2

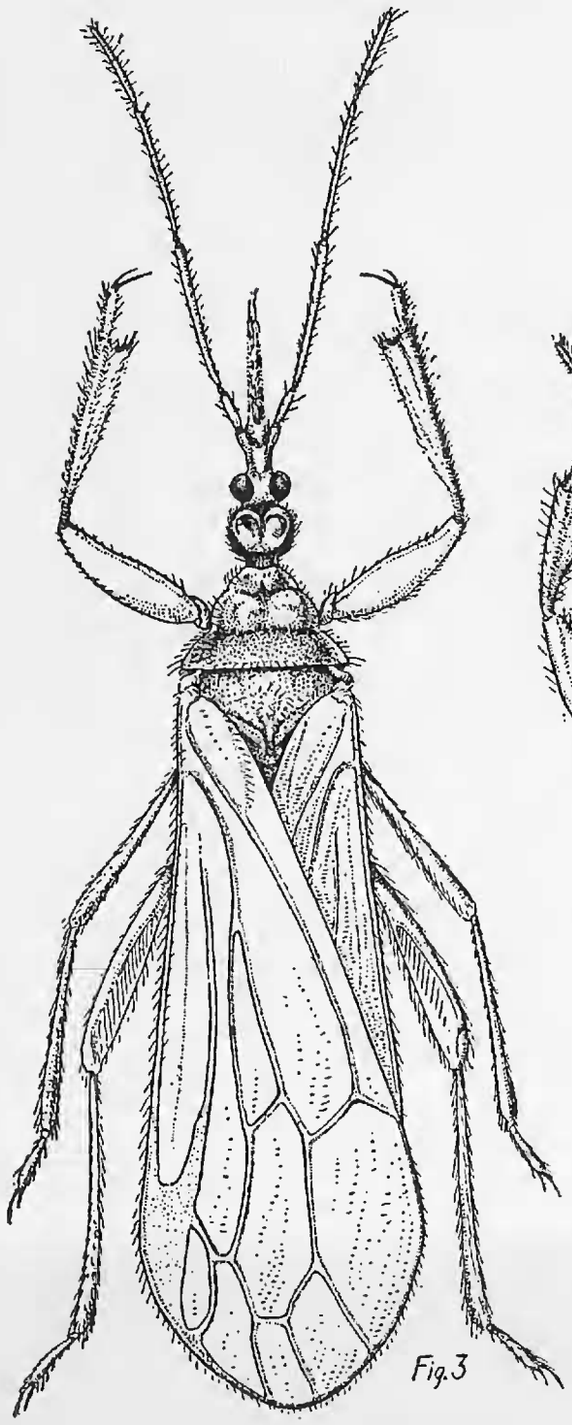

Fig. 3

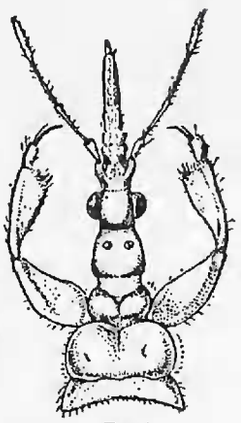

Fig. 4

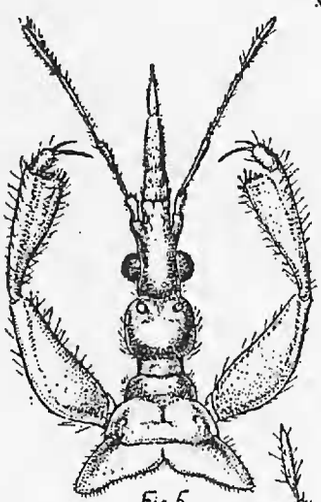

Fig. 5

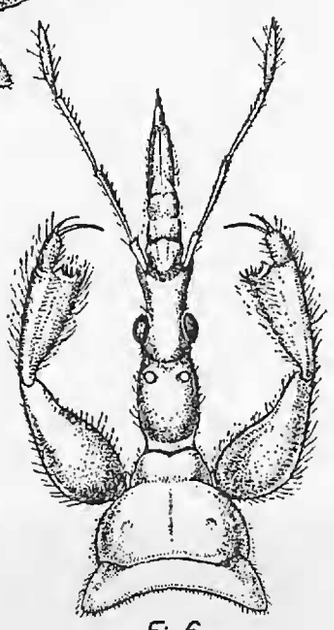

Fig. 6

Explanation of plate on page 156.

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Explanation of Plate

Figure 1. Front wing of *Henicocephalus formicina* (Uhl.). Neural nomenclature after Comstock: C = Costa; Sc = Subcosta; R = Radius; A = Anal; h = Humeral Cross-vein; S = Stigma; D = Discal Cell.
Figure 2. Front wing of *Systelloderus nitidus* n. sp.
Figure 3. *Henicocephalus formicina* (Uhl.) from a topotype, Griffith Park, Los Angeles, California, December 24, 1930, taken by E. C. Van Dyke.
Figure 4. *Systelloderus nitidus* n. sp. The holotype is figured.
Figure 5. *Systelloderus biceps* (Say) from a topotype, St. Vincent, Pennsylvania, in the E. P. Van Duzee collection.
Figure 6. *Systelloderus crassatus* n. sp. The holotype is figured.

Ephestia Kuehniella Fuscofasciella Rag. in California

The loose bark on dead Digger Pine trees and stumps in the Sierra foothills is utilized by woodpeckers for the storage of acorns. Throughout the winter, and perhaps all year around, larvæ of the above-mentioned moth may be found working on these acorns. The writer accidentally collected some of these larvæ in March, 1928, near Oroville. In January, 1931, a deliberate attempt to obtain specimens just below Shingle Springs, El Dorado County, was very successful.

The adults of this variety average slightly larger (22 to 24 mm.) than specimens of the typical species on hand, and are darker, lacking the pinkish tinge found on the fore wings of the latter. The antemedian white fascia edged outwardly with fuscous is the most conspicuous wing feature. The larvæ are large, fat, and pinkish.

As well as on acorns, complete life cycles were induced on almonds and raisins, showing this moth to have the same potentialities as the typical species. This occurrence is of interest as an illustration of a storage pest in nature without man's agency. Mr. Carl Heinrich, United States Bureau of Entomology, determined the species.—H. H. Keifer, California Department of Agriculture, Sacramento, California.